Supplementary information for

Enhanced Chemiluminescence Determination of Paracetamol

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Table S1 The concentrate rang of each parameter in 5 levels based on CCD (n=2)

Factor	Symbol	Level				
		α	1	0	-1	-α
H_2SO_4 (M)	X_1	0.018	0.014	0.01	0.006	0.002
SDS % (w/v)	X_2	6.6	5.2	3.8	2.4	1
$KMnO_4$(mM)	X_3	8	6.5	5	3.5	2
Rh.6G (mM)	X_4	2.6	2	1.4	0.8	0.2

Table S2 Design matrixes generated for CCD and obtained response value (PCM 6.6 µM).

Run	Coded value of factors				Response	Predicted
	X_1 (H_2SO_4)	X_2 (SDS)	X_3 (Rh.6G)	X_4 ($KMnO_4$)		
1	0	0	0	0	83315	84300
2	0	0	0	0	85377	84300
3	-1	-1	-1	-1	39583	39196.2
4	0	0	2	0	36529	37458.6
5	0	2	0	0	29873	29455.3
6	0	0	0	0	82412	84300
7	1	-1	1	1	16856	15671
8	-1	1	1	1	38788	38105
9	0	-2	0	0	17092	20356.8
10	-2	0	0	0	59741	61177.3
11	-1	1	1	-1	54269	50023
12	1	1	1	1	14302	13976.2
13	-1	1	-1	1	55516	55125.5

14	0	0	0	0	85595	84300
15	-1	1	-1	-1	47875	49989.5
16	-1	-1	1	1	29541	30780.2
17	0	0	-2	0	59245	59162.5
18	1	-1	-1	1	37125	37408.3
19	0	0	0	0	84310	84300
20	1	1	-1	-1	54289	50143.2
21	1	1	1	-1	45469	46961.9
22	1	-1	-1	-1	47821	48369.5
23	2	0	0	0	46811	462218
24	-1	-1	1	-1	39654	37727.9
25	1	1	-1	1	32420	34211.7
26	0	0	0	0	35156	84300
27	-1	-1	-1	1	50930	49302.7
28	0	0	0	-2	43871	44693.1
29	0	0	0	0	84920	84300
30	0	0	0	2	21789	21814
31	1	-1	1	-1	44009	43686.5

Table S3 Analysis of Variance for Response (ANOVA)

Source	DOF	Seq SS	Adj SS	Adj MS	F-value	P-value
Regression	14	14480018288	14480018288	1034287021	508.03	0.000
Linear	4	1951443497	1951443497	487860874	239.63	0.000
H2SO4	1	335500470	335500470	335500470	164.79	0.000
SDS	1	124174053	124174053	124174053	60.99	0.000
KMnO4	1	706584572	706584572	706584572	347.07	0.000
Rh.6G	1	785184401	785184401	785184401	385.67	0.000
Square	4	11675228112	11675228112	2918807028	1433.68	0.000
H2SO4*H2SO4	1	579682710	1673544600	1673544600	822.03	0.000
SDS*SDS	1	4750360362	6304722384	6304722384	3096.81	0.000
KMnO4*KMnO4	1	1688116183	2314899007	2314899007	1137.05	0.000
Rh.6G*Rh.6G	1	4657068858	4657068858	4657068858	2287.50	0.000
Interaction	6	853346679	853346679	142224446	69.86	0.000
H2SO4*SDS	1	81355890	81355890	81355890	39.96	0.000
H2SO4*KMnO4	1	10334618	10334618	10334618	5.08	0.039
H2SO4*Rh.6G	1	443850090	443850090	443850090	218.01	0.000
SDS*KMnO4	1	2255253	2255253	2255253	1.11	0.308
SDS*Rh.6G	1	24703385	24703385	24703385	12.13	0.003
KMnO4*Rh.6G	1	290847443	290847443	290847443	142.86	0.000
Residual Error	16	32574058	32574058	2035879		
Lack-of-Fit	10	27733356	27733356	2773336	3.44	0.072
Pure Error	6	4840702	4840702	806784		
Total	30	14512592346				
R-Sq = 99.78%						
R-Sq(adj) = 99.58%						
R-Sq(pred) = 98.85%						

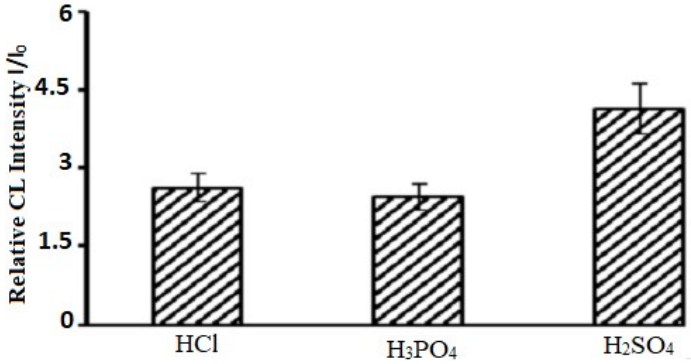
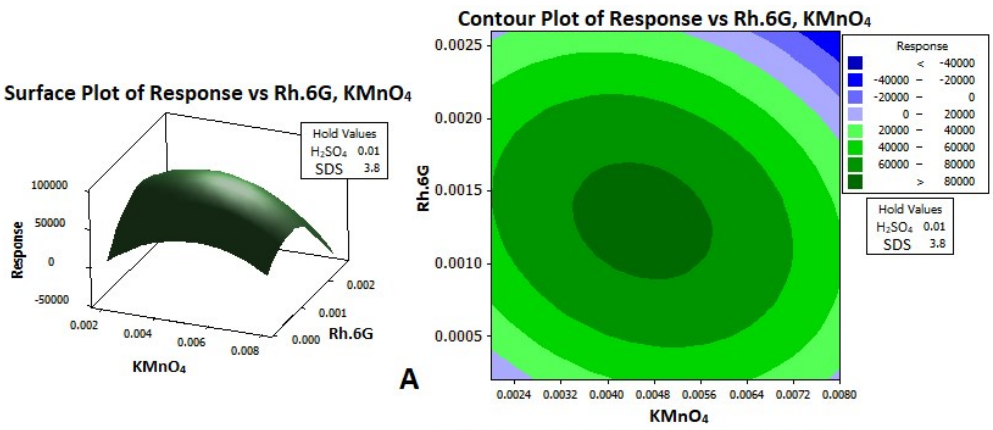
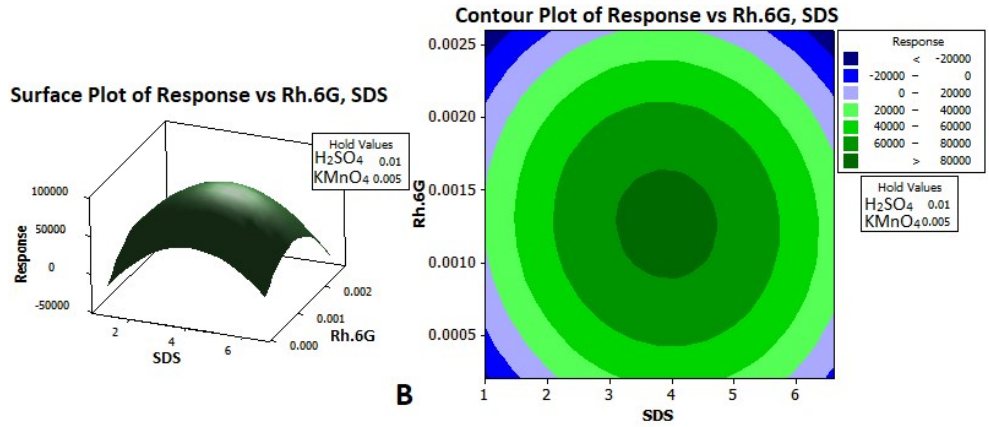
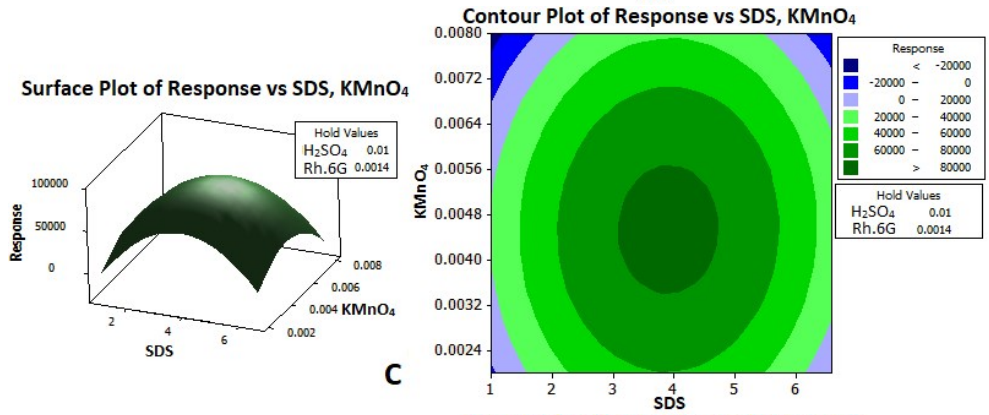
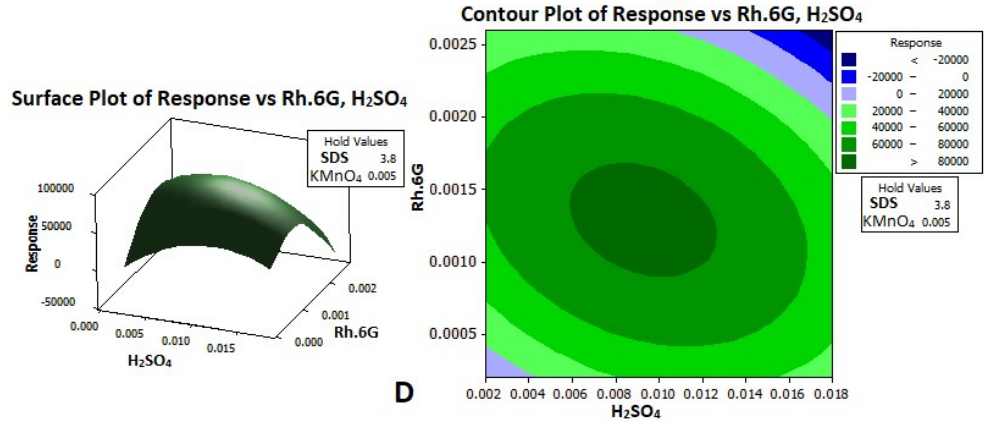


Fig. S1 Effect of the various acids on the signal/blank ratio. Condition: $KMnO_4$, 2.5 mM; Rh.6G, 1 mM; PCM, 6.6 µM; SDS, 5% (w/v); acid (HCl, H_3PO4, and H_2SO_4), 0.01 M; All of the reagents dissolved in distilled water (n=5); (monitored at 560 nm).


Surface Plot of Response vs Rh.6G, KMnO4
Hold Values
H2SO4 0.01
SDS 3.8
Response
KMnO4
Rh.6G
Contour Plot of Response vs Rh.6G, KMnO4
Response
Hold Values
H2SO4 0.01
SDS 3.8
Rh.6G
KMnO4
A


Surface Plot of Response vs Rh.6G, SDS
Hold Values
H2SO4 0.01
KMnO4 0.005
Response
SDS
Rh.6G
Contour Plot of Response vs Rh.6G, SDS
Response
Hold Values
H2SO4 0.01
KMnO4 0.005
Rh.6G
SDS
B


Surface Plot of Response vs SDS, KMnO4
Hold Values
H2SO4 0.01
Rh.6G 0.0014
Response
SDS
KMnO4
Contour Plot of Response vs SDS, KMnO4
Response
Hold Values
H2SO4 0.01
Rh.6G 0.0014
KMnO4
SDS
C


Surface Plot of Response vs Rh.6G, H2SO4
Hold Values
SDS 3.8
KMnO4 0.005
Response
H2SO4
Rh.6G
Contour Plot of Response vs Rh.6G, H2SO4
Response
Hold Values
SDS 3.8
KMnO4 0.005
Rh.6G
H2SO4
D

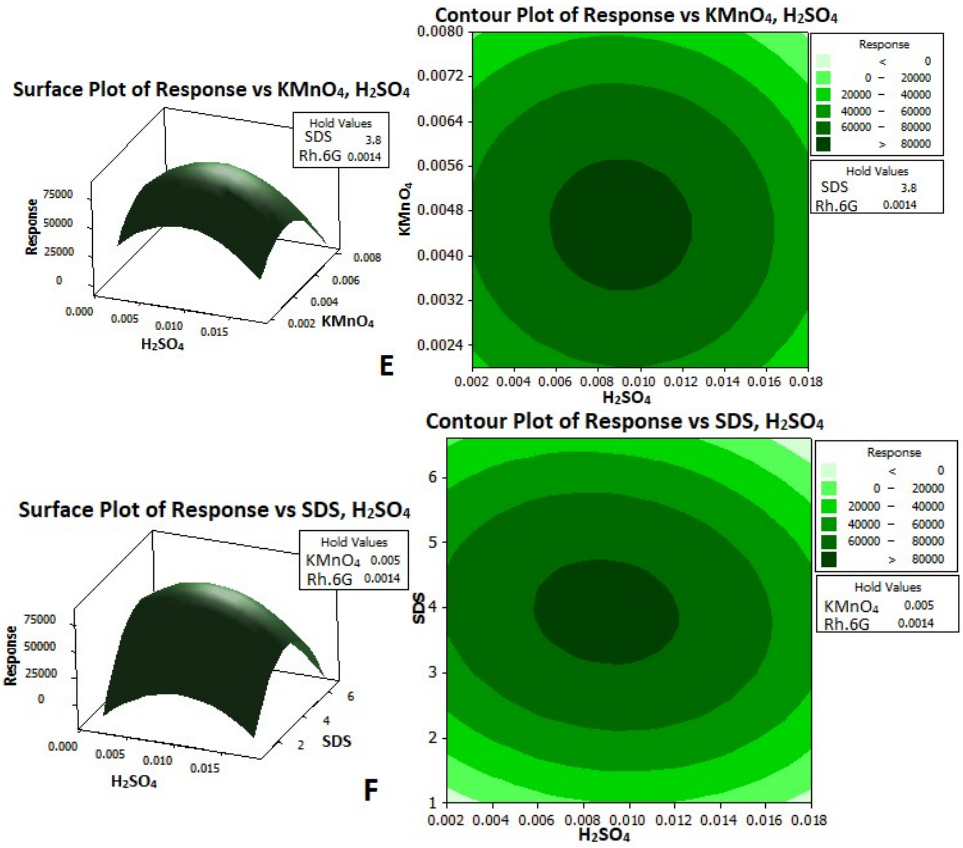
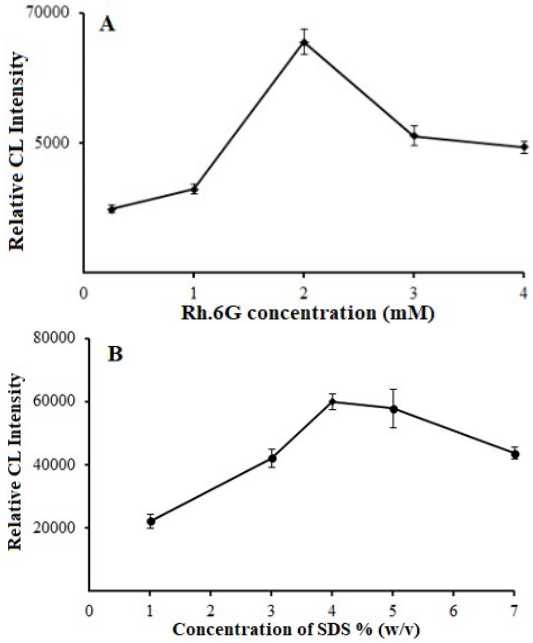


Fig. S2 Response surface plot and contour plot of CL intensity as a function of: (A) Rh.6G and $KMnO_4$ concentration at H_2SO_4, 0.01 M and SDS 3.8% (w/v); (B) Rh.6G concentration and SDS% at H_2SO_4, 0.01 M and $KMnO_4$, 5 mM; (C) $KMnO_4$ concentration and SDS% at H_2SO_4, 0.01 M and Rh.6G, 1.4 mM; (D) Rh.6G and H_2SO_4 concentration at $KMnO_4$, 5 mM and SDS, 3.8% (w/v); (E) $KMnO_4$ and H_2SO_4 concentration at SDS, 3.8% (w/v) and Rh.6G, 1.4 Mm; (F) SDS % and H_2SO_4 concentration at $KMnO_4$, 5 mM and Rh.6G, 1.4 mM. All of the experiments were tested at the present of the PCM, 6.6 µM.



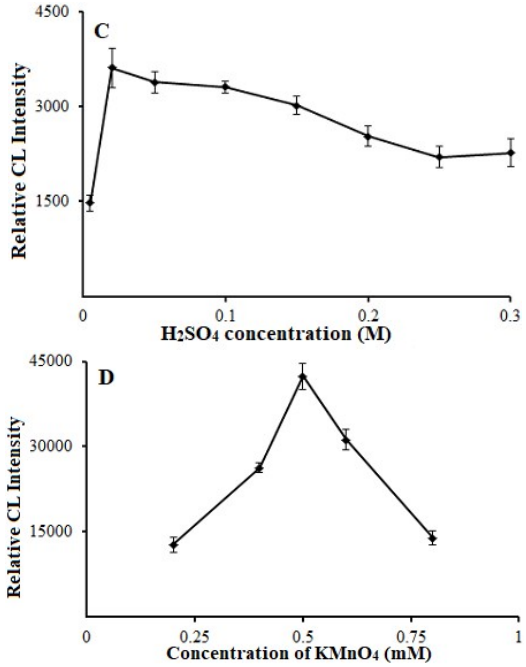


Fig. S3 (A) The effect of concentration of Rh.6G. Condition: PCM, 6.6 µM; SDS, 5% (w/v); H_2SO_4 0.05 M; $KMnO_4$, 2.5 Mm; (B) The effect of concentration of SDS. Condition: PCM, 6.6 µM; Rh.6G, 2 mM; H_2SO_4, 0.05 M; $KMnO_4$, 2.5 mM; (C) The effect of concentration of H_2SO_4. Condition: PCM, 6.6µM; SDS, 4% (w/v); Rh.6G, 2 mM; $KMnO_4$, 2.5 Mm; (D) The effect of concentration of $KMnO_4$. Condition: PCM, 6.6µM; SDS, 4% (w/v); Rh.6G, 2 mM; H_2SO_4, 0.02 M. All of the reagents dissolved in distilled water. (n=5)